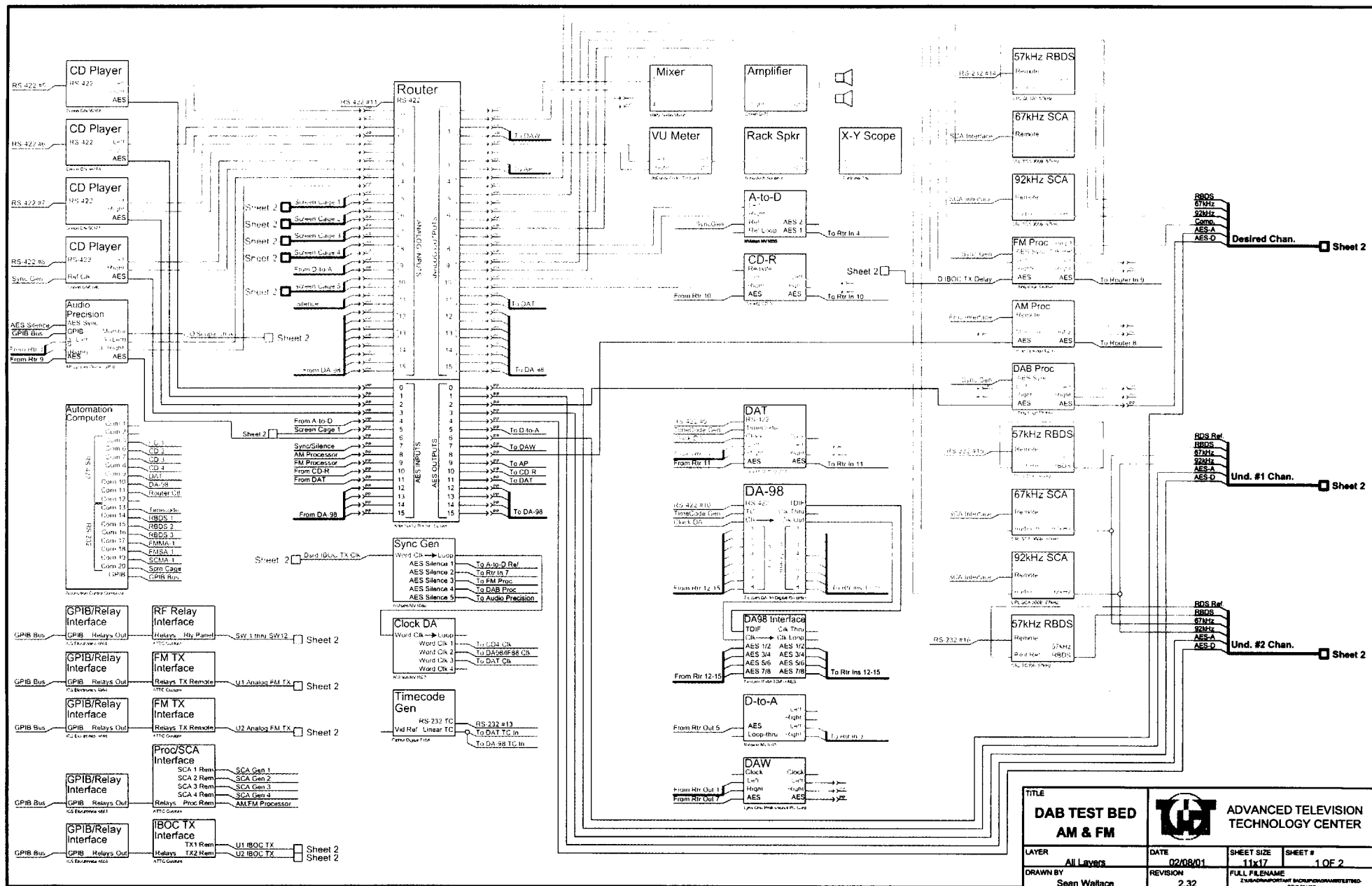
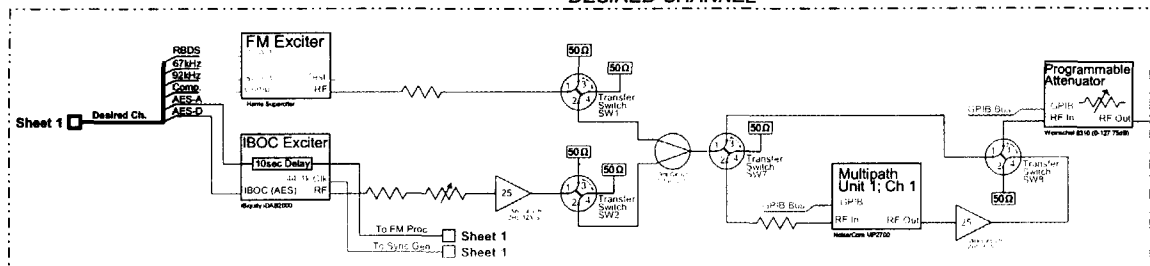
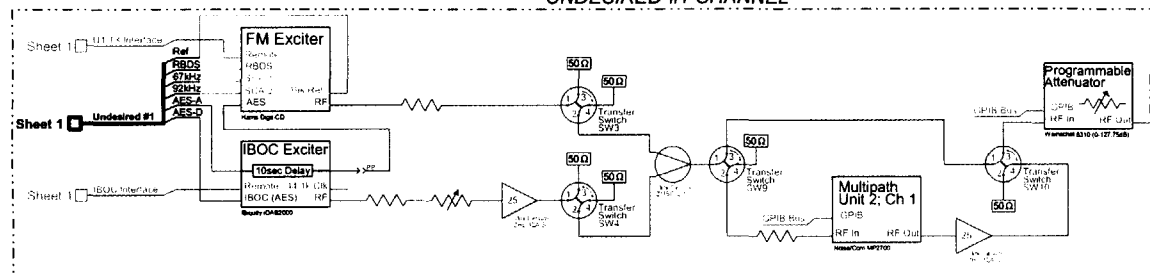


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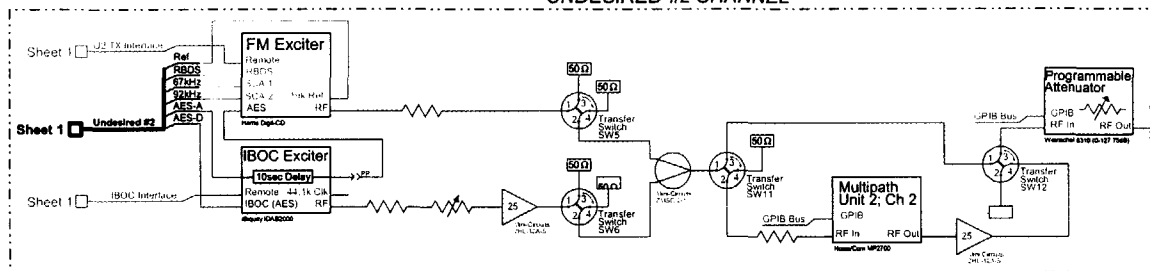




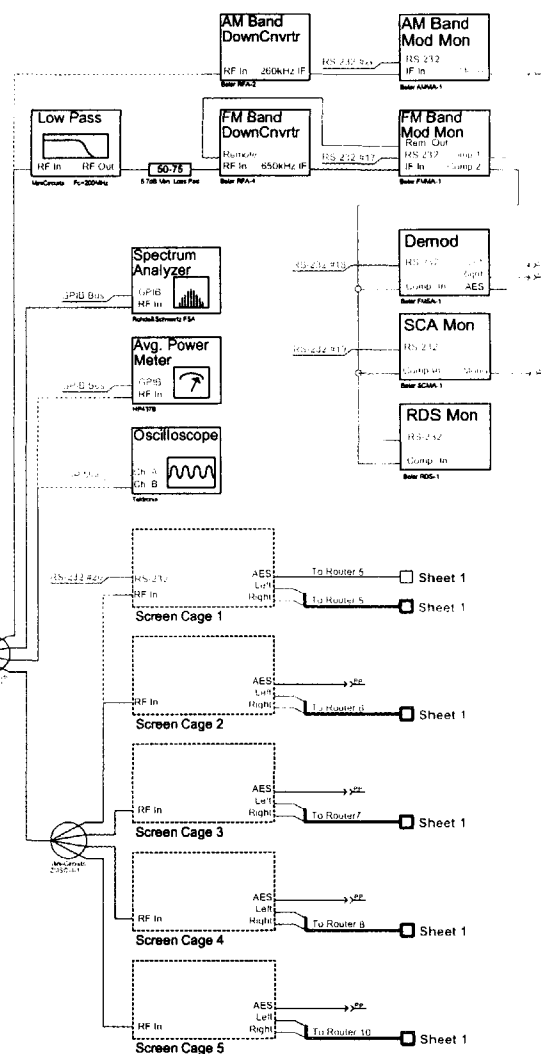
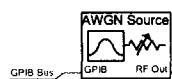
UNDESIRE #1 CHANNEL




UNDESIRE #2 CHANNEL



NOISE AND IMPAIRMENT CHANNEL



TITLE DAB TEST BED AM & FM		 ADVANCED TELEVISION TECHNOLOGY CENTER	
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Digital Audio Broadcasting

IBOC Laboratory Test Procedures – FM Band

Document No. 01-03

August 2001

Revision 4.2

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1 Introduction

1.1 General Overview

1.1.1 Background

Over the course of the past 24 months, the Advanced Television Technology Center (ATTC) has developed an extensive test program for the purpose of testing proposed In-Band-On-Channel (IBOC) Digital Audio Broadcasting (DAB) systems. This program has included the development of detailed test methodologies and procedures for IBOC DAB system testing. It has also entailed the design, construction and operation of a sophisticated IBOC DAB test platform. The test platform was designed to support a comprehensive set of IBOC DAB tests, including both compatibility and performance tests types. Additionally, the platform was designed to perform these tests with an exceptionally high degree of reliability, repeatability and accuracy.

Also during this time, the National Radio Systems Committee (NRSC) has undertaken an effort to develop a standard for In-Band-On-Channel (IBOC) Digital Audio Broadcasting (DAB). As part of this standardization process, the NRSC is currently considering the IBOC DAB system of iBiquity Digital Corporation. In order to better understand the characteristics of iBiquity's proposed system, the NRSC has outlined a series of tests which must be performed on the system. In addition, the NRSC has identified a need for these tests to be performed by an independent third party laboratory.

Given the fact that ATTC has extensive experience in testing IBOC DAB systems, and has a sophisticated test platform available, it has been determined that ATTC will complete the NRSC specified tests.

In some cases, the test results will be numeric, such as Signal-to-Noise (S/N) readings and Block Error Rates (BLER). In these cases, the numeric test results will be archived, and a copy presented to iBiquity Digital. Other interested parties (e.g. NRSC and FCC) will be able to obtain copies of these numeric tests results, subject to the approval of iBiquity. In other cases, the test results will be audio recordings. In these cases, the recordings will also be archived, and copies presented to iBiquity Digital. It is expected that iBiquity Digital will request that additional copies of the recordings be forwarded to other laboratories for subjective listening tests.

1.1.2 Document Scope

This document details the tests, methodologies and procedures to be used in the aforementioned NRSC defined tests. The tests and methodologies are largely based on the NRSC document entitled: *"IBOC Laboratory Test Procedures – FM Band, Rev. 19e, March 8, 2001"*. This NRSC document defines required test conditions and provides a basis for developing detailed procedures. From the NRSC document, ATTC developed detailed methodologies and procedures, which can be readily executed in a laboratory environment. The goal of this document is to provide a concise explanation of all test procedures, such that the test engineer and all other readers will be able to better understand the implementation and execution of each test.

Readers of this document may also be interested in the construction and performance of the physical test platform. This information may be obtained from the following ATTC documents:

1. *Test Bed Proof-Of-Performance Plan (ATTC Doc. 00-05)*
2. *Test Bed Proof-Of-Performance Record of Test Results (ATTC Doc. 01-01)*
3. *Test Bed Daily Calibration Plan (ATTC Doc. 01-16)*
4. *Test Bed Periodic Calibration Plan (ATTC Doc. 01-17)*
5. *Test Bed Daily Calibration Record of Test Results (open ATTC document)*

1.1.3 Document Structure

This document is organized to take advantage of the fact that many RF signals, audio signals, RF test procedures and audio test procedures are used repeatedly throughout the testing process. For example, analog FM signals are used in many tests. Rather than repeating the definition of an analog FM signal within each individual test procedure, the definition is provided once, at the start of the document, and referred to throughout the remainder of the document. Similarly, there are many occasions where a S/N measurement must be performed. Instead of repeating the S/N measurement procedure many times throughout the document, the procedure is defined once, and then referred to as necessary.

As an example of this organization, the reader should note that section 2 contains definitions for common audio and RF *signals*. Section 3 defines common audio and RF *procedures*.

The IBOC system test procedures are broken into two broad categories: *compatibility* and *performance*. Sections 4 and 5 detail the tests contained within these two categories. It should be noted that the order of tests within these sections is inconsequential. The test engineer may choose to execute these tests in the most appropriate and/or convenient order.

1.2 Methodology Overview

1.2.1 Objectives

The test procedures outlined in this document have two primary objectives which may be broadly categorized as:

1. Quantify the impact of IBOC on existing analog radio stations
2. Quantify the performance of IBOC under varied RF channel conditions

Objective number one (1) is referred to as *compatibility testing*. In compatibility testing, various adjacent channel and co-channel interference scenarios are simulated in the laboratory. For each scenario, tests are run to determine if the impact of an IBOC interferer is significantly different than the impact of an analog interferer.

Objective number two (2) is referred to as *performance testing*. In performance testing, the IBOC signal is subjected to a wide variety of interference and RF channel conditions. For each condition, the performance of IBOC is evaluated.

1.2.2 Simulated Channel Conditions & Receivers Under Test

In order to meet the primary objectives listed above, a series of controlled laboratory tests will be performed, where each test includes various communications channel impairments that are common in the FM radio band. These channel impairments will include:

1. First adjacent channel interference
2. Second adjacent channel interference
3. "Host" channel interference
4. AWGN noise interference
5. Multipath impairments
6. Impulse noise impairments

For *compatibility* testing, the performance of commercially available analog FM and FM SCA receivers¹ will be evaluated under some of these channel impairment conditions. The primary variable for these compatibility tests will be the *presence or absence of IBOC* within the FM band.

For *performance* testing, the performance of a prototype IBOC digital receiver will be evaluated under all of these channel impairment conditions. The primary variable will be the *severity of the interference or impairment* within the FM band. In most cases, the severity will be increased until the IBOC system fails to recover digital audio and/or data.

1.2.3 Evaluation Methods

Broadly speaking, there are two methodologies which may be used to evaluate the performance of analog and IBOC receivers under the conditions outlined above. These evaluation methodologies may be defined as:

1. Objective evaluation
2. Subjective evaluation

The first method, objective evaluation, is comprised of test methodologies which utilize standard audio and/or data test equipment to measure and quantify audio quality in an accurate and repeatable manner. For example, audio signal-to-noise ratio (S/N) may be used as a benchmark to objectively quantify audio quality. Alternatively, Block Error Rate (BLER) may be used to objectively quantify IBOC performance.

The second method, subjective evaluation, is comprised of test methodologies that use the human auditory system as the primary measuring "instrument". These methods may incorporate listening tests or some other procedure in order to evaluate the "overall quality" as perceived by a human listener.

In the procedures detailed in this document, the tests are designed for both objective and subjective evaluation. For objective compatibility tests, S/N and stereo separation are used to quantify audio quality. For objective performance tests, BLER and signal "mode" are used to quantify performance. For all subjective tests, audio recordings are used to

¹ NRSC has undertaken the task of selecting the analog receivers to be tested. The list of NRSC suggested receivers may be found in Appendix A.

quantify audio quality. It is expected that iBiquity will employ additional laboratories to perform further subjective evaluation of these recordings in an "off-line" environment.

1.3 Standard Practices

The procedures for each individual test are specified in detail in later sections. However, there are some methodologies and standard practice common to all tests, which shall be described here and are applicable to all test groups.

1.3.1 Test Bed Calibration

There are three types of calibration which shall be performed on the test platform:

(1) Proof-of-Performance (2) Periodic Calibration (3) Daily Calibration

Proof-of-Performance calibration shall be conducted once, prior to the commencement of testing. This calibration shall be designed to comprehensively verify the performance of the system as a whole, as well as the performance of each individual system component. If a measuring instrument requires calibration to a NIST traceable standard, then it will be verified that instrument calibration is valid throughout the expected testing period. The proof-of-performance stage will also result in a comprehensive list of all test equipment within the test platform, including all switch/menu/jumper settings.

Periodic calibration occurs when the test platform is reconfigured or when deemed necessary by the test engineer. Periodic calibration is not as comprehensive as a full proof-of-performance, and may focus only on the areas of the test platform which have been changed since the initial proof-of-performance.

Daily calibration consists of system level tests, which are designed to expeditiously verify that all equipment within the test bed is operational and performance has not significantly changed from day-to-day. Daily calibration will be performed at the start of *every* test day, and an ongoing log will be kept for all daily calibration results.

1.3.2 Automated Tests

In order to perform the required tests in a reasonable amount of time, it may be necessary to automate some of the measurement and test bed setup procedures. The details of any automation system shall be documented separately from this test plan. This test plan shall outline the necessary steps to perform a measurement, and these steps shall be performed regardless of whether the routine is ultimately performed manually or by the automation system.

2 Signal Descriptions

The following sections describe the characteristics of the various desired and undesired signals, which shall be used throughout testing. When this test plan refers to an “Undesired Hybrid Interferer Type II” for example, the definition of such a signal may be found in the following subsections.

2.1 FM Band Signals

2.1.1 Desired Analog – Type I

A desired analog signal of Type I is designed to be used in analog compatibility and performance tests that employ objective evaluation. Such a signal shall have the following characteristics:

- 1) Main channel modulation:
 - a) Stereo transmission
 - b) 75 μ s pre-emphasis
 - c) 10% pilot injection
 - d) Audio:
 - i) **Analog Compatibility Tests** Sinusoidal test tone of 1kHz at 90% modulation (67.5kHz deviation) with no dynamic range processing (Pilot contributes 10% for total modulation = 100%)
 - ii) **Digital Performance Tests** Clipped Pink Noise (as described in 2.2.1). Peaks shall be equal to 90% modulation (67.5kHz deviation). Pilot accounts for the remaining deviation; total=100%
- 2) Subcarriers:
 - a) None
- 3) Main Carrier:
 - a) 97.9 MHz
- 4) Power
 - a) Weak: -77dBm
 - b) Moderate: -62dBm
 - c) Strong: -47dBm

2.1.2 Desired Analog – Type II

A desired analog signal of Type II is designed to be used in analog compatibility tests that employ subjective evaluation. Such a signal shall have the following characteristics:

- 1) Main channel modulation:
 - a) Stereo transmission
 - b) 75 μ s pre-emphasis
 - c) 10% pilot injection
 - d) Audio:
 - i) Selected critical listening material (chosen from Appendix B) peaking at 90% modulation (67.5kHz deviation). Pilot contributes 10% for total modulation = 100%

- ii) Dynamic range processing shall be applied. The type of processing shall be consistent with the musical genre of the audio. Appendix B specifies which of the three processing types shall be applied to each audio cut. Appendix C enumerates the audio processor settings that define these three processing types.
- 2) Subcarriers:
 - a) None
- 3) Main Carrier:
 - a) 97.9 MHz
- 4) Power
 - a) Weak: -77dBm
 - b) Moderate: -62dBm
 - c) Strong: -47dBm

2.1.3 Desired Analog – Type III

A desired analog signal of Type III is designed to be used in SCA analog compatibility tests that employ objective evaluation. Such a signal shall have the following characteristics:

- 1) Main channel modulation:
 - a) Stereo transmission
 - b) 75 μ s pre-emphasis
 - c) 10% pilot injection
 - d) Audio:
 - i) Clipped Pink Noise (as described in 2.2.1). Peaks shall be equal to 80% modulation (60.0kHz deviation). Pilot & SCA account for the remaining deviation; total=110%
 - e) Subcarriers:
 - i) 67kHz at 10.0% injection - FM modulated by 400Hz tone with 5kHz deviation and 150 μ s pre-emphasis
 - ii) 92kHz at 10.0% injection - FM modulated by 5kHz low-pass filtered LPF USASI (as described in 2.2.3), with 5kHz deviation and 150 μ s pre-emphasis
- 2) Main Carrier:
 - a) 97.9 MHz
- 3) Power
 - a) Weak: -77dBm
 - b) Moderate: -62dBm
 - c) Strong: -47dBm

2.1.4 Desired Analog – Type IV

A desired analog signal of Type IV is designed to be used in SCA analog compatibility tests that employ subjective evaluation. Such a signal shall have the following characteristics:

- 1) Main channel modulation:
 - a) Stereo transmission
 - b) 75 μ s pre-emphasis
 - c) 10% pilot injection
 - d) Audio:

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- i) MMW audio cut (see Appendix B) with *Medium* audio processing applied (see Appendix C). Peaks shall be equal to 80% modulation (60.0kHz deviation). Pilot & SCA accounts for the remaining deviation; total=110%
- e) Subcarriers:
 - iii) 67kHz at 10.0% injection - FM modulated by the selected critical listening material (chosen from Table B-2 in Appendix B), with 5kHz peak deviation and 150uS pre-emphasis
 - iv) 92kHz at 10.0% injection - FM modulated by the MaleB1 audio cut (see Table B-2 in Appendix B), with 5kHz peak deviation and 150uS pre-emphasis
- 2) Main Carrier:
 - a) 97.9 MHz
- 3) Power
 - a) Weak: -77dBm
 - b) Moderate: -62dBm
 - c) Strong: -47dBm

2.1.5 Desired Analog – Type V

A desired analog signal of Type V is designed to be used in RBDS analog compatibility tests that employ objective evaluation. Such a signal shall have the following characteristics:

- 1) Main channel modulation:
 - a) Stereo transmission
 - b) 75μs pre-emphasis
 - c) 10% pilot injection
 - d) Audio:
 - i) Clipped Pink Noise (as described in 2.2.1). Peaks shall be equal to 87% modulation (65.3kHz deviation). Pilot & SCA accounts for the remaining deviation; total=100%
 - e) Subcarriers:
 - i) 57kHz RBDS at 3.0% injection
- 2) Main Carrier:
 - a) 97.9 MHz
- 3) Power
 - a) Weak: -77dBm
 - b) Moderate: -62dBm
 - c) Strong: -47dBm

2.1.6 Desired Analog – Type VI

A desired analog signal of Type VI is designed to be used in DARC analog compatibility tests that employ objective evaluation. Such a signal shall have the following characteristics:

- 1) Main channel modulation:
 - a) Stereo transmission
 - b) 75μs pre-emphasis
 - c) 10% pilot injection
 - d) Audio:

- i) Clipped Pink Noise (as described in 2.2.1). Peaks shall be equal to 85% modulation (63.8kHz deviation). Pilot & SCA accounts for the remaining deviation; total=105%
- e) Subcarriers:
 - i) 76kHz DARC at 10.0% injection and "C" frame coding method
- 2) Main Carrier:
 - a) 97.9 MHz
- 3) Power
 - a) Weak: -77dBm
 - b) Moderate: -62dBm
 - c) Strong: -47dBm

2.1.7 Desired Hybrid – Type I

A desired hybrid signal of Type I is intended to be used in analog compatibility and digital performance tests that employ objective evaluation.

This signal shall be defined as the spectral sum of an analog desired signal and the digital carriers as generated by an iBiquity Digital IBOC exciter in hybrid mode. The digital carriers utilize OFDM modulation; further details are proprietary to iBiquity.

The analog portion of the signal shall be defined by 2.1.1.

The sum of *all* digital carriers in the hybrid signal shall have an *average* power that is 20dB below the average analog power. The measurement method for setting and verifying this power ratio is outlined in 3.1.4.

For compatibility tests, the digital carriers may or may not be modulated by audio. Due to the randomization process, it is not expected that modulation of the digital carriers will affect compatibility results in any manner.

2.1.8 Desired Hybrid – Type II

A desired hybrid signal of Type II is intended to be used in analog compatibility tests that employ subjective evaluation.

The analog portion of the signal is defined by 2.1.2. The digital portion of the signal is identical to the Type I signal described in 2.1.7.

2.1.9 Desired Hybrid – Type III

A desired hybrid signal of Type III is intended to be used in SCA analog compatibility tests that employ objective evaluation.

The analog portion of the signal is defined by 2.1.3. The digital portion of the signal is identical to the Type I signal described in 2.1.7.

2.1.10 Desired Hybrid – Type IV

A desired hybrid signal of Type IV is intended to be used in SCA analog compatibility tests that employ subjective evaluation.

The analog portion of the signal is defined by 2.1.4. The digital portion of the signal is identical to the Type I signal described in 2.1.7.

2.1.11 Desired Hybrid – Type V

A desired hybrid signal of Type V is intended to be used in RBDS analog compatibility tests that employ objective evaluation.

The analog portion of the signal is defined by 2.1.5. The digital portion of the signal is identical to the Type I signal described in 2.1.7.

2.1.12 Desired Hybrid – Type VI

A desired hybrid signal of Type VI is intended to be used in DARC analog compatibility tests that employ objective evaluation.

The analog portion of the signal is defined by 2.1.6. The digital portion of the signal is identical to the Type I signal described in 2.1.7.

2.1.13 Undesired Analog Interferer – Type I

An undesired analog interferer of Type I is intended to be used in analog compatibility tests that employ objective evaluation. Such a signal shall have the following characteristics:

- 1) Main channel modulation:
 - a) Stereo transmission
 - b) 75 μ s pre-emphasis
 - c) 10% pilot injection
 - d) Audio
 - i) Clipped Pink Noise (as described in 2.2.1). Peaks shall be equal to 90% modulation (67.5kHz deviation). Pilot accounts for the remaining deviation; total=100%
- 2) Subcarriers:
 - a) None
- 3) Main Carrier:
 - a) For upper 2nd adjacent: 98.3MHz
 - b) For upper 1st adjacent: 98.1MHz
 - c) For co-channel: 97.9MHz
 - d) For lower 1st adjacent: 97.7MHz
 - e) For lower 2nd adjacent: 97.5MHz

2.1.14 Undesired Analog Interferer – Type II

An undesired analog interferer of Type II is intended to be used in analog compatibility tests that employ subjective evaluation. Such a signal shall have the following characteristics:

- 1) Main channel modulation:
 - a) Stereo transmission
 - b) 75 μ s pre-emphasis
 - c) 10% pilot injection

- d) Audio
 - i) Processed Rock (as described in 2.2.2). Peaks shall be equal to 90% modulation (67.5kHz deviation). Pilot accounts for the remaining deviation; total=100%
- 2) Subcarriers:
 - a) None
- 3) Main Carrier:
 - a) For upper 2nd adjacent: 98.3MHz
 - b) For upper 1st adjacent: 98.1MHz
 - c) For co-channel: 97.9MHz
 - d) For lower 1st adjacent: 97.7MHz
 - e) For lower 2nd adjacent: 97.5MHz

2.1.15 Undesired Hybrid Interferer – Type I

An undesired hybrid interferer of Type I is intended to be used in analog compatibility tests that employ objective evaluation.

This signal shall be defined as the spectral sum of an analog undesired signal and the digital carriers as generated by an iBiquity IBOC exciter in hybrid mode. The digital carriers utilize OFDM modulation; further details are proprietary to iBiquity.

The analog portion of the signal shall be defined by 2.1.13.

The sum of *all* digital carriers in the hybrid signal shall have an *average* power that is 20dB below the average analog power. The measurement method for setting and verifying this power ratio is outlined in 3.1.4.

The digital carriers may or may not be modulated by audio. Due to the randomization process of the audio, it is not expected that modulation of the digital carriers will affect test results in any manner.

2.1.16 Undesired Hybrid Interferer – Type II

An undesired hybrid interferer of Type II is intended to be used in subjective analog compatibility tests, subjective performance tests and objective performance tests.

The analog portion of this signal is defined by 2.1.14. The digital portion of this signal is identical to the previously described signal in 2.1.15.

2.1.17 Additive White Gaussian Noise

Where AWGN noise is specified, a broadband noise signal shall be added to the spectrum at the specified power level. This noise shall have flat spectral characteristics between 88MHz and 108MHz. Beyond these frequency limits, the noise shall be sharply attenuated with a bandpass filter. The peak amplitude excursions of the noise signal shall have a Gaussian probability distribution.

Section 3.1.5 describes the procedure used to determine and set the power level of this additive white gaussian noise.

2.2 Baseband Audio

This subsection describes “standard” audio recordings which shall be used throughout the testing process. In particular, it is critical that a “standardized interferer” is developed for each type of test.

2.2.1 Standardized Interferer - Clipped Pink Noise

In order to approximate the program material of a typical FM rock station, a signal informally referred to as “clipped pink noise” has been developed and was used in previous DAB tests². Clipped pink noise is generated by sending standard pink noise (equal energy per octave) through an FM stereo generator. The FM stereo generator serves to band limit and process the pink noise, with the resulting spectrum approximating typical FM program material averaged over time.

For the purpose of these tests, a CD recording of this processed pink noise shall be made and used wherever the test plan calls for it. It should also be noted that if the test plan calls for clipped pink noise on two simultaneous interferers, then these two sources of clipped pink noise shall *not* be correlated to each other in time (i.e. two different recordings must be played in two different CD players).

Table 2-1 and Figure 2-1 illustrate the recording and processor setup used to generate clipped pink noise (Please note that only the relevant processor settings are listed below; additional jumper and menu settings may be found in the test bed configuration documentation).

Figure 2-2 illustrates the spectrum of an FM signal modulated by clipped pink noise. It shall be verified that the clipped pink noise recording generates a spectrum consistent with this figure.

Table 2-1 Stereo Generator and Processor Setup for Clipped Pink Noise

Model: Orban Optimod-FM 2200-D S.N.: 738106-023 JH			
Type	Description	Setting	Notes
Menu	EQ→30Hz HPF	In	
Menu	EQ→Low Pass	+1dB	
Menu	EQ→HF Enhance	+5	
Menu	Gate Thres.	-40dB	
Menu	AGC	On	
Menu	AGC Drive	10dB	
Menu	2B Drive	18dB	
Menu	Release Time	11dB/s	
Menu	Bass Coupling	20%	
Menu	HF Limit	+2.0	
Menu	Clipping	+2.0	
Menu	Final Clip	0.0	

² Electronic Industries Association (EIA), Consumer Electronics Group, “Digital Audio Radio Lab Tests, Transmission Quality Failure Characterization and Analog Compatibility”, 8/11/95

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Model: Orban Optimod-FM 2200-D

S.N.: 738106-023 JH

Type	Description	Setting	Notes
Menu	I/O→Input	Analog	
Menu	I/O→Analog In→AI Ref VU	+4.0dBu	
Menu	I/O→Analog In→AI Clip	+27.0dBu	
Menu	I/O→Digital Out→DO 100%	0.0dBFS	
Menu	I/O→Digital Out→DO preemph	Pre-emph	
Menu	I/O→Digital Out→DO Rate	44.1kHz	
Menu	I/O→Digital Out→DO Sync	Internal	
Menu	Stereo Enc→Preemphasis	75uS	
Menu	Stereo Enc→Mode	Stereo	
Menu	Stereo Enc→Pilot Level	8.5%	
Menu	Test→Mode	Operate	

The above configuration shall be saved as "User Preset 2-2B"

Figure2-1 Recording Setup for Clipped Pink Noise

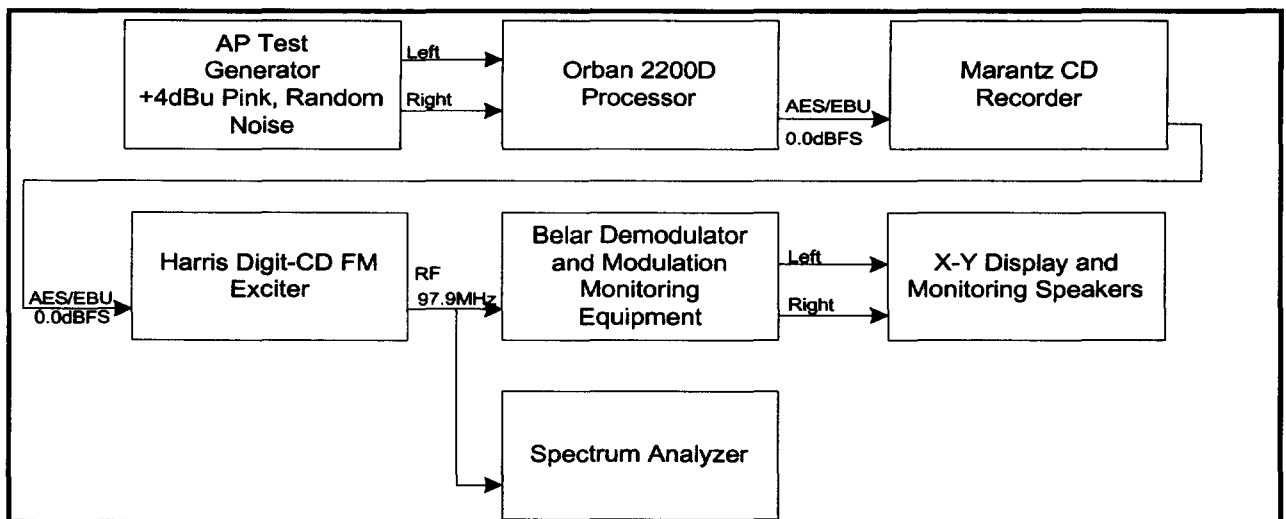
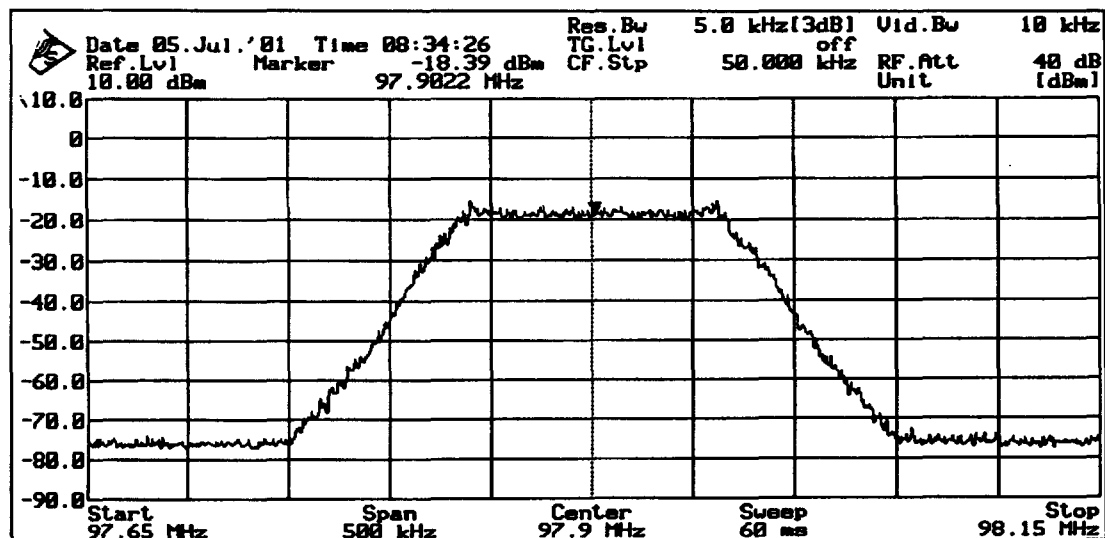


Figure2-2 Standardized Interferer: Clipped Pink Noise



2.2.2 Standardized Interferer – Processed Rock

In addition to the clipped pink noise described above, a standard interferer must be generated which simulates “processed rock” (which is assumed to be one of the worst interferers). While clipped pink noise does an excellent job of producing maximum deviation with a low peak to average ratio, as an interferer it is missing one critical component which many listeners find objectionable – the beat. For this reason, a clipped pink noise interferer is used for tests with objective evaluation such as S/N; and a processed rock interferer is used for tests with subjective evaluation such as listening tests.

As in the case of clipped pink noise, a CD recording of this processed rock shall be made and used wherever the test plan calls for it. It should also be noted that if the test plan calls for processed rock on two simultaneous interferers, then these two sources must be time offset from each other (i.e. two different recordings must be played in two CD players with start times offset from each other)

The processed rock shall be generated in a similar fashion to the clipped pink noise recording. However, instead of using the AP Generator as a source, a Digital Audio Workstation (DAW) shall be used.

The audio material will be a continuous loop of Metallica, the NRSC’s interference audio selection (see Appendix B). The processing will be performed by an Omnia-FM processor, using the custom NRSC preset known as “Jacked” (see Appendix C). From this setup, a CD recording of the processed loop will be made.

Figure 2-3 illustrates the recording and processor setup used to generate processed rock. Figure 2-4 illustrates the spectrum of an FM signal modulated by processed rock. It shall be verified that the processed rock recording generates a spectrum consistent with this figure.

Figure 2-3 Recording Setup for Processed Rock

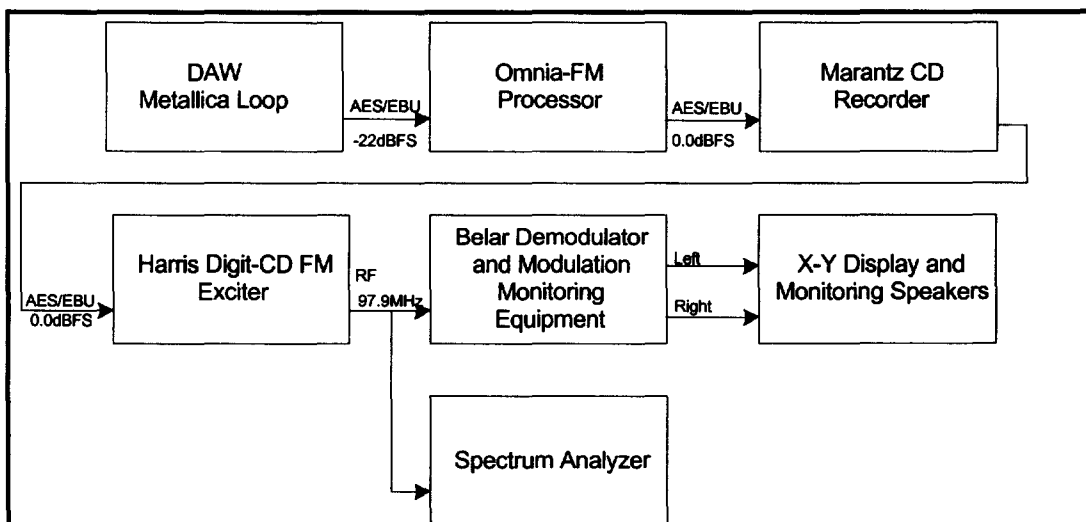
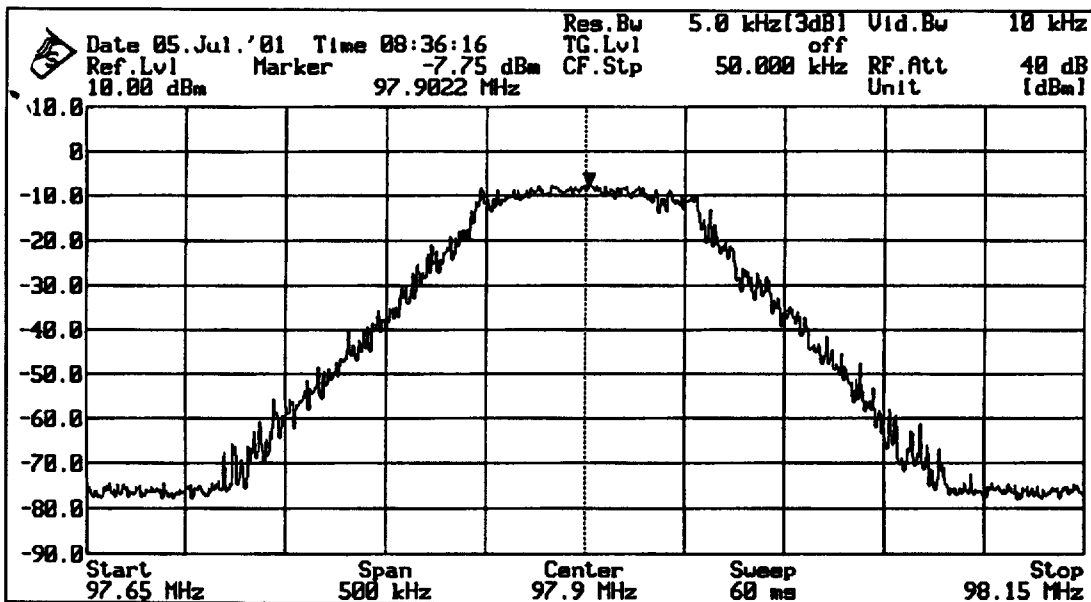


Figure 2-4 Standardized Interferer: Processed Rock



2.2.3 Standardized Interferer – LPF USASI

In addition to the clipped pink noise and processed rock signals described above, another signal was developed, and labelled *LPF USASI*. This LPF USASI signal was designed to simulate program material that may be found on typical FM SCA services.

Basic USASI noise was developed by the United States of America Standards Institute. Its intended purpose is to simulate unprocessed program material. Since SCA services typically do not employ external processors, it was decided that USASI noise was appropriate to simulate program material that may be found on an SCA service. However, in order to simulate the bandwidth typically found on an SCA service, the USASI noise was passed through an additional 5kHz low pass filter. This combination of USASI noise and low pass filtering results in a repeatable noise signal, which represents program material on a severely band-limited service. The resultant audio was termed *LPF USASI* for the purposes of these tests.

The USASI noise was generated by playback of the *NAB Broadcast and Audio System Test CD* (Track 48). The low pass filter was realized by an Orban 9200/UD AM processor, operating in a 5kHz bandwidth mode, with all dynamic range processing disabled. The frequency response of the processor operating in this mode is shown in Figure 2-5. Figure 2-6 shows the spectrum of the resultant low pass filtered USASI.

The output of the processor was then recorded to CD. This CD recording of LPF USASI will be used to modulate 67kHz and 92kHz SCA's as specified by the relevant test procedures.

Figure 2-5 Frequency Response of 5kHz Low Pass Filter

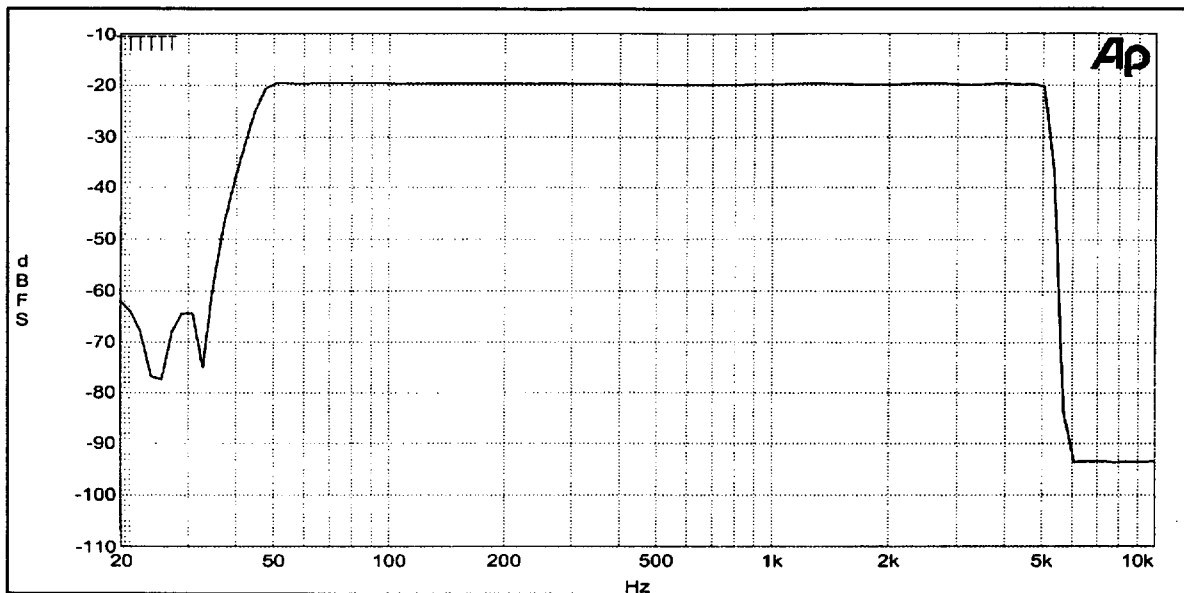


Figure 2-6 Spectral Content of LPF USASI

